

THE BEHAVIOR OF SOME *VITIS* INTERSPECIFIC TABLE GRAPE VARIETIES IN THE CLIMATE CONDITIONS OF THE COPOU-IASI WINE CENTER

COMPORTAREA UNOR SOIURI PENTRU STRUGURI DE MASĂ OBȚINUTE PRIN HIBRIDARE INTERSPECIFICĂ ÎN CONDIȚIILE CLIMATICE ALE CENTRULUI VITICOL COPOU - IASI

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Abstract. *The adaptation of the new created genotypes to the eco-pedo-climatic conditions of various geographical areas is an important characteristic in order to expand and promote them into the vineyards. The purpose of this work was to study the behavior in the climatic conditions of the Copou-Iași viticultural center, of two new grapevine varieties for table grapes (Codreanca and Argessis), obtained by interspecific hybridization. The two genotypes stood out for their earliness and high yields (4-6 kg/vine stock), similar to the control variety Moldova, as common genitor. Sugar accumulations occurred according to the biological potential of each variety, varying between 165 and 195 g/L, ensuring, along with total acidity (4.9-6.0 g/L), a harmonious taste balance. The analyzed interspecific varieties efficiently capitalized the climatic resources of the ecosystem, showing good resistance to stress factors, ensuring high and quality productions, being well adapted to the climatic area of cultivation (N-E of Romania).*

Key words: adaptation, interspecific hybridization, new varieties, table grapes.

Rezumat. *Adaptarea genotipurilor nou create la condițiile eco-pedo-climatice din diferite areale geografice reprezintă o caracteristică importantă a acestora în vederea extinderii și promovării lor în cultură. Lucrarea de față a avut ca scop studiul comportării în condițiile climatice ale centrului viticol Copou-Iași, a două soiuri noi de viță de vie pentru struguri de masă (Codreanca și Argessis), obținute prin hibridare interspecifică. Cele două genotipuri s-au remarcat prin timpurietate și producții ridicate (4-6 kg/butuc), apropiate de cele ale variantei martor (soiul Moldova; genitor comun). Acumulările în zaharuri au variat în funcție de potențialul biologic al fiecărui soi, variind între 165 și 195 g/L, asigurând, alături de aciditatea totală (4,9-6,0 g/L), un gust armonios. Soiurile analizate au valorificat eficient resursele climatice ale ecosistemului, prezentând rezistență bună la factorii de stres, asigurând producții ridicate și de calitate, fiind bine adaptate arealului climatic în care au fost cultivate (N-E României).*

Cuvinte cheie: adaptare, hibridare interspecifică, soiuri noi, struguri de masă.

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INTRODUCTION

The interspecific grapevine hybrids are the products of crossing of two or more *Vitis* species and due to their higher yield and excellent tolerance to fungal diseases, nematodes, *Phylloxera* and low temperatures, without the need for grafting, have become a renewed goal of grapevine breeding programs (Filimon *et al.*, 2020). The adaptation of the new created genotypes to the eco-pedo-climatic conditions in different geographical areas is an important characteristic in order to promote and spread the new *Vitis* varieties in the vineyards. The aim of this study was to assess the behavior in the climatic conditions of the Copou-Iași viticultural center, of two new grapevine varieties for table grapes (Codreanca and Argessis), obtained by interspecific hybridization, compared to the Moldova hybrid variety, as common genitor. The research focused on observations and determinations regarding the dynamics of vegetation phenophases, productivity, grape yield and quality, in direct relation to the ecological factors of the vineyard.

MATERIAL AND METHOD

The study was carried out in the period 2019-2021, the plant material being represented by two new varieties for table grapes obtained through interspecific hybridization: Codreanca (synonym Black Magic; VIVC variety number: 7569) obtained through interspecific crossing of genotypes Moldova × Marșaliskii, created at the Scientific-Practical Institute of Horticulture and Food Technologies in Chisinau, Republic of Moldova (Nicolaescu and Cazac, 2013), and the Argessis variety (VIVC variety number: 22840), obtained at the National Institute of Research - Development for Biotechnologies in Horticulture Ștefănești-Argeș through interspecific hybridization between Moldova × Augusta varieties (Necula *et al.*, 2010), in relation to the control variety Moldova, as common genitor. All the varieties are growing within the eco-pedo-climatic conditions of the Copou-Iasi wine center (Iasi vineyard; N-E of Romania), grafted on SO4 (Selection Oppenheim 4) rootstock. The soil of the plots is chernozem type, the planting distances are 2.2/1.2 m, in the semi-tall culture system.

Total acidity (g/L tartaric acid) and sugar content (g/L) were determined according to OIV protocols (OIV, 2019), while polyphenolic and anthocyanin potential of the harvest were assessed according to ITV method (Cayla *et al.*, 2002). The biological resistance of the varieties was evaluated using the method of ampelographic descriptors proposed by the OIV (OIV, 2009).

RESULTS AND DISCUSSIONS

During the period 2019 - 2021 the average annual temperatures were higher than the multiannual value (9.83°C), reaching values of 10.1°C in 2021 and 12.0°C in 2020. The amount of annual rainfall was very close to the multiannual value, except for the year 2019, when only 478.7 mm was recorded, compared to 579.6 mm (multiannual average) (tab. 1).

Table 1

The main climatic characteristics of the years of study in the Copou-lași area

Year	Multianual value (1980-2010)	2019	2020	2021
Average temperature (°C)	9.83	11.6	12.0	10.1
Absolute minimum in air (°C)	-27.2	-12.0	-8.4	-16.3
Absolute maximum in air (°C)	42.3	35.1	36.2	34.5
Real insolation (hours)	2044.0	2150	2145	2030
Rainfall (mm)	579.6	478.7	547.4	593.4
Real heliothermic index	2.0	2.34	2.47	1.85
Hydrothermal coefficient	1.3	1	0.91	1.38
Viticultural bioclimatic index	7.1	8.9	9.96	6.20
Oenoclimatic aptitude index	4106.1	4638.4	4786.1	4137.2
Huglin heliothermic index	-	2247.4	2323.2	1978.65
Night cooling index	-	11.4	13.6	9.9

Climatic factors from the 2019-2021 period directly influenced the onset and development of the main phenophases of the hybrid varieties. Thus, budburst took place between April 18th and May 3rd, first for the Codreanca variety (April 18th - April 28th), followed by of the Argessis variety and the control variety Moldova. (tab. 2). The onset of the phenophases varied from one year to another, depending on the average daily air temperatures, the useful heat balance (UHB) being calculated. Thus, in 2020, the bud burst phenophase starting earlier compared to the years 2019, 2021, due to higher average daily temperatures, recorded in April.

Table 2

Phenological spectrum of the studied varieties under the conditions of the Copou-lași viticultural center

Genotype	Year	Bud burst		Bloom		Veraison		Grape maturity	
		Date	UHB (°C)	Date	UHB (°C)	Date	UHB (°C)	Date	UHB (°C)
Codreanca	2019	23.04	16.7	08.06	302.4	16.07	457.4	17.08	389.2
	2020	18.04	31.6	10.06	257.3	20.07	472.1	15.08	356.6
	2021	28.04	13.1	18.06	303.5	25.07	482.9	01.09	437.1
Argessis	2019	26.04	28.5	12.06	343.2	24.08	783.2	21.09	269.2
	2020	18.04	31.6	10.06	257.3	20.08	896.5	17.09	341.1
	2021	02.05	38.5	20.06	298.0	20.08	799.8	30.09	238.1
Moldova	2019	27.04	36.3	12.06	335.4	18.08	703.9	08.10	424.9
	2020	20.04	32.3	12.06	280.4	22.08	901.3	30.09	408.0
	2021	03.05	42.9	23.06	334.4	26.08	816.0	20.10	194.4

Note: UHB (°C) - useful heat balance (the sum of the differences between the average daily temperature higher than 10°C and the biological threshold of the grapevine (10°C)).

The bloom began in the first decade of June in 2019 and 2020, and in the second half of June in 2021, being conditioned by UHB values between 257.3°C and 343.2°C, while the grape veraison starts in the second half of July (16-25), for the Codreanca variety and a month later for the Argessis and Moldova varieties.

The grape ripening coincided with the harvest date and was registered in the second decade of August for the Codreanca variety, in the second half of September for the Argessis variety, and in the first half of October for the Moldova variety.

Fertility, as the average of the three years data, it varied very little according to variety, Codreanca variety showing the lowest value (55%). The absolute fertility coefficient was also higher for the Codreanca variety, while the relative fertility coefficient did not exceed 0.60 in none of the analyzed varieties (tab. 3).

Table 3

Evaluation of the fertility characteristics of the studied interspecific varieties

Genotype	Number of shoots/ vine stock	Fertile shoots/ vine stock	Percentage of fertile shoots (%)	Number of inflorescences	Coefficients of fertility	
					RFC	AFC
Codreanca	20,00	11	55,00	12	0,60	1,09
Argessis	19,00	11	57,89	11	0,57	1,00
Moldova	21,00	12	57,14	12	0,57	1,00

Note: RFC - relative fertility coefficient (inflorescences / total number of shoots); AFC - absolute fertility coefficient (inflorescences / number of fertile shoots).

The evaluation of the biological potential of the analyzed genotypes was carried out according to the list of OIV descriptors for table grapes, the studied varieties being marked with grades of 9 both in terms of frost resistance (100% viability of winter buds) and drought resistance (tab. 4).

Table 4

Evaluation of the biological potential of the varieties studied in the Copou - Iasi viticultural Center (2019 - 2021) - frost and drought resistance

Genotype	Frost resistance - viable buds (%)	Drought resistance - expression code	Degree of resistance
Codreanca	100	Very good	9
Argessis	100	Very good	9
Moldova	100	Very good	9

Even if the rainfall was unevenly distributed during the vegetation period, the studied genotypes showed a very high resistance to drought, without any specific manifestations of water stress. In the climatic conditions of the study period, after the application of seven anti-cryptogamic treatments, the studied varieties showed a very good resistance, specific to the interspecific cultivars, powdery mildew and downy mildew not affecting the hybrid genotypes (tab. 5).

The average production per vine stock varied between 3.90 kg for the Codreanca variety and 5.05 kg for the Moldova variety, while the average production calculated per hectare was 14.75 t/ha for the Codreanca variety, respectively 19.12 t/ha for the Moldova variety (tab. 6).

Table 5

The behavior of the interspecific varieties at the main diseases of the grapevine

Genotype	Downy mildew (<i>Plasmopara viticola</i>)		Powdery mildew (<i>Uncinula necator</i>)		Gray mould (<i>Botritis cinerea</i>)	
	Leaf OIV 452	Grape OIV 453	Leaf OIV 455	Grape OIV 456	Leaf OIV 458	Grape OIV 459
Codreanca	9	9	9	9	9	9
Argessis	9	9	9	9	9	9
Moldova	9	9	9	9	9	9

For all three genotypes, the marketable production was over 90%, with the higher values for the Moldova control variety (93%), that showed a longer shelf life of grapes on the plant and a better resistance to transport and storage, compared to the tested varieties (tab. 6).

Table 6

The main quantitative characteristics of the studied interspecific varieties

Genotype	Number of cluster/vine stock	Actual yield (kg/ vine stock)	Calculated yield (t/ha)	Marketable production (%)
Codreanca	12	3.90	14.76	90
Argessis	11	4.20	15.90	90
Moldova	12	5.05	19.12	93

The quality of the grapes, indicated by the average weight of the berries, the sugar content and the total acidity of the must, reflected both the specific genetic character of each individual genotype and the influence of climatic factors on these elements. The analyzed varieties were characterized by medium-large grapes, with an average weight between 325 g (Codreanca) and 420 g (Moldova) (tab. 7). The weight of 100 berries, was specific to each genotype, ranging from 608.00 g for the grapes of Moldova variety to 693.00 g for Argessis variety.

Table 7

Quantitative and qualitative production of the studied varieties

Genotype	Grape weight (g)	Weight of 100 berries (g)	Sugars (g/L)	Total acidity (g/L tartaric acid)	Sugar/acidity ratio
Codreanca	325	687.00	165.00	4.84	34.00
Argessis	381	693.00	196.00	5.65	34.69
Moldova	420	608.00	184.00	7.20	25.55

In the climatic conditions of the studied years, the studied varieties showed average to high sugar concentrations (169 g/L Codreanca variety, 184 g/L Moldova variety and 196 g/L Argessis variety). Codreanca variety grapes showed the lowest total acidity of the must (4.84 g/L tartaric acid), while Moldova variety presented a low sugar-acidity ratio, due to higher acidity of grapes.

The total polyphenolic index determined by the ITV method (extraction of crushed berries with 0.1% HCl and 95% ethanol) showed values between 23.7 and 28.8, the highest value being obtained for the Moldova variety grapes (tab. 8).

Polyphenolic content of grapes of the interspecific varieties at harvest

Genotype	DO 280 nm	Polyphenolic index	DO520	Anthocyanins (mg/L)	Total anthocyanin potential (mg/kg)
Codreanca	0.079	23.7	1.1034	502	1506
Argessis	0.088	26.4	1.2147	553	1658
Moldova	0.096	28.8	1.3012	592	1776

The same trend was maintained in the case of the anthocyanin content and the anthocyanin potential of the interspecific varieties, the values being consistent with their hereditary character and the climatic conditions of the harvest year.

CONCLUSIONS

1. The climatic conditions recorded during the study period (2019-2021) in the Copou-Iasi viticultural center allowed the normal deployment of all the vegetative phenophases of the studied interspecific genotypes, as well as to express their biological potential.

2. The resistant variety Codreanca was characterized by an earlier ripening of grapes compared to the control variety Moldova, the grapes being well-favored, with large berries, blue-black in color, crunchy and with a pleasant taste.

3. The Argessis variety showed a superior yield and higher polyphenolic accumulation compared to Codreanca variety, the grapes reaching maturity in the second half of September.

4. The Moldova variety ripened the grapes in the VI-VII epochs, retaining a slightly higher acidity at maturity, but managing to accumulate important concentrations of phenolic compounds (including anthocyanins).

5. The experimental results obtained indicate that the studied interspecific varieties are well adapted to the conditions in N-E of Romania vineyards, with very good biological resistances and high yields, the grapes presenting superior quality characteristics, being intended for fresh consumption.

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